Interagency Ecological Program for the Sacramento-San Joaquin Estuary

Newsletter

Vol. 10, No. 1 — Winter 1997

For information on the Interagency Ecological Program, visit our home page on the World Wide Web (*www.iep.water.ca.gov*).

Readers are encouraged to submit brief articles or ideas for articles. Correspondence, including requests for changes in the mailing list, should be addressed to Randy Brown, California Department of Water Resources, 3251 S Street, Sacramento, CA 95816-7017.

Interagency Program Quarterly Highlights

These quarterly highlights summarize significant activities and findings of the Interagency Program during the past 3 months.

Delta Flow Measurement

Rick Oltmann

The San Joaquin River at Jersey Point UVM double velocity rating problem has been rectified. A velocity rating has been developed for use during ebb-to-flood flows and another has been developed for use during flood-to-ebb flows. The computer program used to compute UVM flows has also been modified to deal with this unique double rating. By not using the flood-to-ebb velocity rating when computing the flow, as was initially done for May 1994 to April 1995, an error of about 5,000 cubic feet per second results in the calculated net daily flow; the maximum computed tidal flows (150,000 cfs) were not affected. Flows for May 1994 to April 1995 have been recalculated using an estimated flood-to-ebb velocity rating that is based on the newly developed ebb-to-flood velocity rating, which will be used to compute flows from November 1995 to the present. We began collecting data at this site again in November 1995, when the destroyed transducer pile was replaced.

Velocity ratings have been developed for the Sacramento River at Rio Vista UVM sites. Flows are being calculated starting from April 1995. Once this is completed, flows measured at Rio Vista, Jersey Point, Threemile Slough, and Dutch Slough will be used to estimate delta outflow.

The other UVM sites provided usable data throughout the quarter. During a 2-week period in November, several upward looking acoustic

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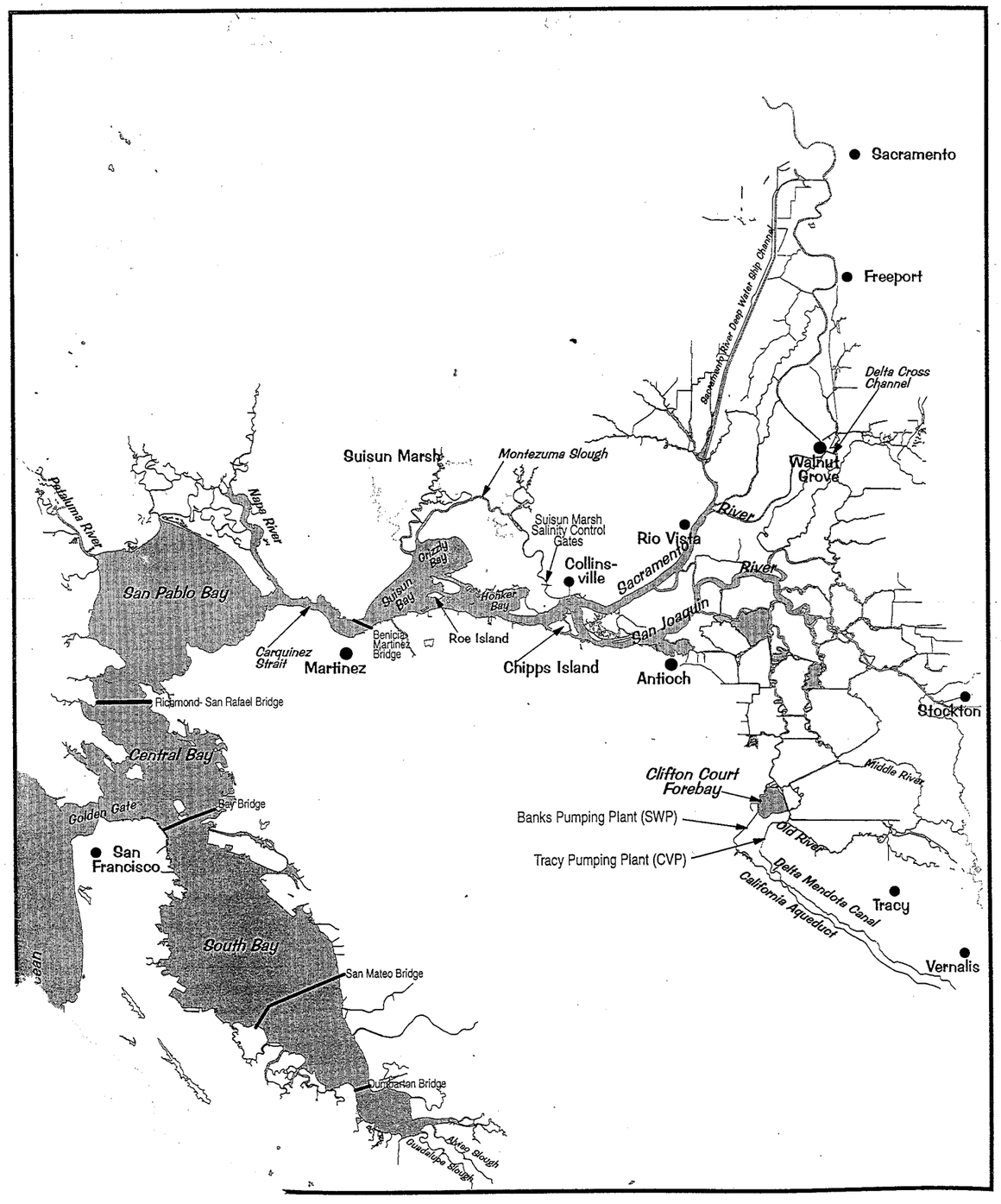
SACRAMENTO-SAN JOAQUIN DELTA AND SAN FRANCISCO BAY ESTUARY



Doppler current profilers were deployed on the channel bottom at the Threemile Slough UVM site. The purpose was to evaluate if a flow record can be produced using the vertical velocity profile measured by the ADCP as a surrogate for the index line velocity measured by the UVM.

Effects of Contaminants

Leo Winternitz

The Contaminant Effects Team reviewed a half dozen research proposals and selected two for funding:

- Herbicide Concentrations and Potential Effects on Phytoplankton Photosynthesis and Primary Productivity in the Bay-Delta Ecosystem (J. Edmunds, K. Kuivila, J. Cloern)
- Reproductive Success and Larval Growth in Declining Fish Populations of Upper San Francisco Bay and Delta in Relation to Trace Organic Compounds (R. Spies)

The team spent the rest of the quarter developing a 5-year plan and strategy that will direct development and selection of research work and proposals. Specifically, a number of presentations were made on potential contaminant problems affecting this estuary. The presentations were organized into topic areas, and priority was assigned based on the relative importance of the specific issue and potential effects on the estuary's biota. The prioritized list will enable the team to focus on proposal development and to conduct research on the ranked topics.

The team is now soliciting proposals for the five areas with highest priority:

- Organophosphate insecticide toxicity.
- Effects of contaminants on striped bass recruitment.
- Effects of contaminants on delta smelt.
- Impacts of contaminants on reproductive success of key fish species.
- Causes of fathead minnow toxicity.

Proposals on these topics will be discussed in late January.

Phytoplankton Monitoring

Peggy Lehman

The higher chlorophyll *a* concentrations in the southern and eastern regions of the delta persisted through October. At Vernalis, chlorophyll *a* concentrations were 14-20 μg/L and were associated with a mixed diatom assemblage dominated by *Skeletonema potamos* and *Aulacoseira granulata* (*Melosira granulata*). Farther downstream, at Stockton and the Mokelumne River, chlorophyll *a* concentrations were 4-7 μg/L and were associated with a mixed phytoplankton assemblage. Concentrations were less than 3 μg/L for most of the other stations sampled, but values were slightly higher (4-5 μg/L) at San Pablo Bay and Greens Landing.

Neomysis/Zooplankton Study

Jim Orsi

Neomysis was not caught during fall with the exception of a single specimen in Suisun Slough. *Neomysis* has been extremely rare in fall since 1993. In contrast, *Acanthomysis* was fairly abundant throughout fall, with peaks in the Sacramento River at Sherman Island and in the entrapment zone in October. *Acanthomysis* had a bimodal annual abundance in 1996 with the primary mode in July and the secondary one in October.

Gammarus abundance peaked at 17/m^3 in November in the entrapment zone. It was much more abundant than *Corophium*, which had a peak of only 0.07/m^3 in November and was not caught in September and October.

The native copepods, *Diaptomus* and *Cyclops*, were rare during fall. *Eurytemora* reappeared in very low numbers in Montezuma Slough and western Suisun Bay in October and November. As usual, *Limnoithona* was the most abundant copepod in fall, with peak abundance of 20,000/m^3 in the entrapment zone. *Psuedodiaptomus forbesi* was almost as abundant in October. A predacious introduced copepod, *Tortanus*, had its highest abundance since its introduction, peaking at 3,574/m^3 at Martinez in October. *Oithona davisae* peaked at the same time and place as *Tortanus*. Its abundance was 11,569/m^3. On the other hand, *Sinocalanus* abundance was very low, as it has been for several years.

The freshwater cladocerans were not abundant except for *Bosmina* in September in Old River. The brackish water rotifer, *Synchaeta bicornis*, was fairly abundant in Suisun Bay. Other species of the genus *Synchaeta* peaked in the San Joaquin River at Stockton in November.

Green and Mitten Crab Studies

Kathy Hieb

A survey was conducted in September and October 1996 to determine the relative abundance and distribution of the introduced green crab in the estuary. Distribution was very similar to 1995, with crabs collected from South Bay to lower San Pablo Bay. Although catch-per-unit-effort increased at San Pablo Bay stations and decreased at South Bay stations in 1996, the highest CPUE both years was at Triangle Marsh in Hayward Regional Shoreline Park. Juvenile crabs dominated our catches in San Pablo Bay, and 1-year-old crabs dominated our catches in South Bay. Results of the 1996 mitten crab studies are presented in this *Newsletter* (page 14).

Tidal Marsh Study

Kathy Hieb

We continued to explore and test sampling methods for the Tidal Marsh Study. New gear types tested include a large, custom-built fyke for sampling in areas with emergent vegetation, modified "mini" fykes and traps for first- and second-order channels in the marsh plain, a fixed-frame throw cage for areas with soft substrates or submergent vegetation, and a beach seine modified with "skimmers" attached to the lead line for areas with extremely soft substrates. All gear types showed promise for the specific habitat types. We also continued to sample with gear first used in 1995, modifying our methods for different areas. If you are interested in developing methods to sample small fishes in shallow water habitats, please contact Kathy Hieb or Suzanne DeLéon at the DFG Bay-Delta Division.

Delta Smelt

Dale Sweetnam and Leo Winternitz

The monthly sampling of the Fall Midwater Trawl Survey was completed in December. We collected 82 delta smelt, which resulted in a December index of 71.6. This sets the 1996 annual index at 128.3. December results accounted for nearly half of the entire index. On average, the December index accounts for less than one-quarter of the annual index.

The December distribution was centered in western Montezuma Slough and the lower Sacramento River near Collinsville. Of the 82 delta smelt, 40 were collected at one station near the western mouth of Montezuma Slough. One delta smelt was observed at the mouth of the Napa River. This distribution is distinctively different than in September-November, when distribution was concentrated near Chipps Island. The change is probably due to the change in outflow resulting from storms in late November and early December.

Results of the September-November midwater trawl surveys were disturbing because the delta smelt population appeared to have declined dramatically since the 20mm survey in the spring and the tow-net survey in the summer. Therefore, we did a Kodiak trawl survey in October to verify the low numbers. We caught 263 delta smelt at twelve stations in a geographical sweep of the estuary. Although we caught more delta smelt than for the October midwater survey in a wider distribution, density was an order of magnitude lower than for the 1995 Kodiak trawl. The highest density was 139.6/10,000m^3 in 1996 and 1156.1/10,000m^3 in 1995. This suggests that young-of-the-year delta smelt were indeed less abundant than expected based on the spring 20mm and summer tow-net surveys. We are exploring possible causes for this decrease in abundance.

In late October, the Resident Fish Team held a meeting at UC-Davis with Dr. Peter Moyle and contaminant experts to address the apparent low abundance of adult delta smelt.

The Resident Fish Team has initiated growth rate and diet studies; reviewed some ecological parameters that may affect smelt survival, including temperature; and met with contaminant experts to discuss the role contaminants may have on smelt survival. Contaminant study pre-proposals specific to delta smelt have been solicited and reviewed by team members. The pre-proposals will also be reviewed by members of the Contaminants Effects Team. If funding is available, we hope to start some of these contaminant investigations by late winter or early spring.

Collection of live delta smelt began in September for treadmill studies at UC-Davis and culture studies at both UC-Davis and Skinner Fish Facility. Collection has continued through December because delta smelt have been hard to find. Collecting at night has resulted in a dramatic increase in survival. So far, we have collected about 600 live delta smelt.

Six sampling trips to Folsom Lake were scheduled for December to collect larval wakasagi for comparative analysis with larval delta smelt. Larval osmerid identification is still a problem, and several life stages are required to aid in separating the two species.

Estuarine Monitoring

Kathy Hieb

With completion of 1996 sampling in early December, the Interagency Program has continuously monitored the abundance and distribution of fishes, shrimp, and crabs in the lower estuary for 17 years! Several interesting trends are apparent from a preliminary examination of the 1996 data. Abundance of young-of-the-year longfin smelt was relatively low in 1996, with a preliminary index of 11,206. This is about 15% of the 1995 index (the second highest on record) and similar to the 1986 index. Through September, YOY longfin smelt were collected primarily in Central to San Pablo bays, with few in Suisun Bay. Their distribution started to expand in October and by December, they were widely distributed from South Bay to the lower Sacramento River.

The 1996 index of young-of-the-year starry flounder abundance was very similar to the 1995 index, which was the highest since 1983. Although the 1995 and 1996 indices are substantially higher than 1987-1994 indices, adult starry flounder remain uncommon in the estuary, and the population has yet to recover to levels recorded before the early 1980s. In 1996, YOY starry flounder were widely distributed from San Pablo Bay to the lower Sacramento and San Joaquin rivers.

Preliminary indices for young-of-the-year Pacific herring and shiner perch, which rear in the lower embayments, were relatively low in 1996. The 1996 Pacific herring index was about 30% of the 1995 index and the fifth lowest on record. Shiner perch indices have been low since 1988, and the 1996 index continued this trend.

More information on the abundance trends of these and other species will be presented in the spring issue of the *Newsletter*.

Juvenile Salmon

Mark Pierce

Kodiak trawling at Sacramento was conducted 5-7 days/week, and beach seining was increased at sites around Sacramento to 5 days/week as part of an intensive effort to improve our ability to detect winter run and tributary spring run entering the delta while make-up pumping was occurring in the southern delta. The first winter-run-sized fish (72mm) was detected at Sacramento in the trawl on November 25. Only two additional winter run were captured there through December 18. Beach seining along the Sacramento River collected 38 winter-run-sized fish by December 18. The Delta Cross Channel gates were closed on November 20 due to catches of tributary spring run leaving Mill and Deer creeks. They will likely remain closed through the spring.

Trawling at Chipps Island was limited to 1 day/week in October and November due to delta smelt catches. Numbers of smelt dropped in December, allowing 7 day/week towing to recover CWT late-fall fish without moving the trawl site. The first release at Miller Park on December 2 was intended to evaluate survival under low outflow/high export conditions; the release scheduled for January 2 was to evaluate higher outflow/lower export conditions. Early December rains altered conditions somewhat, but we will still try to evaluate a different set of conditions to the extent that we can manipulate exports. Unmarked late-fall-sized fish also showed up in the Chipps trawl in fairly high numbers (70) in December, but no winter-run-sized fish were seen.

The Mossdale Kodiak trawl continues 3 day/week as fog and boat operator availability permit. Again, this is an effort to determine if any San Joaquin basin yearling chinook are coming into the delta in fall and winter. No chinook had been captured through December 18.

The delta subgroup of the Salmon Project Work Team has reviewed several documents this quarter, including the Knights Landing pilot monitoring program report, a proposal to evaluate the effects of the Delta Cross Channel on smolt survival using Coleman CWT releases at Battle Creek, and a 6-year plan to use Merced River Hatchery fish to evaluate the effects of outflow vs. exports on San Joaquin basin smolt survival through the delta. We also reviewed and commented on a plan to restore Prospect Island to a wetland habitat and a proposal for a comprehensive study on the role of Yolo Bypass with respect to delta fish populations.

In June, the Fish and Game Commission created a section of the *California Code of Regulations* titled "Commission Policy on Monitored Species" and designated Sacramento River spring chinook as the first species listed. The policy calls for DFG to monitor and report on the impact of efforts for and status of species listed at least annually. Last fall, the Central Valley Salmon Team created a Spring Chinook Project Work Team to address the Commission's action and provide a forum to coordinate monitoring and restoration activities. The new project work team has met twice and has accomplished a significant action of its own — conversion of data to information. A report, *Status of Actions to Restore Central Valley Spring-Run Chinook Salmon* (December 1996) is available from DFG. Call Ron Camacho at 916/653-0862.

Larval Splittail

Randall Baxter

A recent preliminary look at the 6 years of data have provided some tentative observations. Splittail larvae were collected throughout the delta, lower Mokelumne River, and lower San Joaquin River (downstream of Stockton). In the Sacramento River, larvae were collected as far upstream as we sampled: Garcia Bend in 1989, Grimes in 1990 and 1991, El Dorado Bend in 1992, Knights Landing in 1993, American River in 1994. In 1991 and 1992, density of larvae was relatively high near Grimes, Knights Landing, below Verona (downstream of Sutter Bypass), near the American River, and between Clarksburg and Hood. If higher density represents proximity to spawning areas rather than an artifact of sampling, then this suggests a large section of the Sacramento River is used for spawning in low-flow years.

The data also suggested that catch of larvae increased as flows decreased. This is counter to the theory that splittail larvae are being advected by high outflows and dispersed downstream and suggests that a change in

habitat increased vulnerability to advection or that increased density resulting from less flooded habitat caused some emigration.

Juvenile Sturgeon

Dave Kohlhorst

In October, we completed the last of three scheduled monthly juvenile sturgeon surveys between the western delta and San Pablo Bay. This survey, using baited setlines, is designed to sample 40-116cm sturgeon with the aim of measuring year-class strength. A fin ray, used to age sturgeon, is removed from a subsample of the catch for age determination and development of a current age-length key. The fin ray subsample from the 373 sturgeon captured in this survey have not yet been aged, but an age-length key from earlier sampling was used to assign preliminary ages. The age-frequency distribution is distinctly bimodal, with a small peak at ages 1 and 2 (1994 and 1995 year classes) and a more prominent peak at ages 8-10 (1986-1988 year classes). Catches in a similar survey in 1995 exhibit the same strong peak at ages 8-10, but none at ages 1-2, suggesting that the gear is strongly selective for sturgeon about 100cm total length. The expected strong recruitment from the 1982 and 1983 year classes (now ages 13 and 14, about 115-130cm) is not apparent in the setline catches. Either high mortality has damped their impact on the population or our setlines are ineffective at catching them. The large number of straightened hooks and broken leaders suggests the latter is possible.

Fish Facilities Research

Marty Gingras and Bob Fujimura

We completed two manuscripts for publication as Interagency Program technical reports. Technical Report 50 describes adult salmon migration past the Suisun Marsh Salinity Control Gates. Technical Report 54 reports the movement of adult and subadult striped bass from Clifton Court Forebay via the radial gates. Both studies used acoustic fish tags and automated monitoring stations to study the movement of tagged fish past fixed locations.

Work is continuing on four project documents. A manuscript documenting pre-screen loss research at Clifton Court Forebay from 1976 to 1993 was circulated for final comments. Another manuscript describing use of hydroacoustic sampling to quantify juvenile fish movement at Skinner Fish Facility is being edited. Reports are being written on:

- Abundance, food habits, and removal of adult and subadult striped bass in Clifton Court Forebay, and
- Movement of tagged adult salmon past the experimental Georgiana Slough acoustic fish barrier.

Work has begun with the Fish Physiology group at UC-Davis for the Fish Treadmill Project. We helped collect live delta smelt and construct fish holding facilities. We are developing an email list to facilitate dissemination of information concerning this project. We also provided fish inventory information to CALFED concerning a possible northern delta water diversion.

Fish Salvage Facilities

Scott Barrow

Fish salvage during fall 1996 was fairly normal. The majority of fish were striped bass, white catfish, American and threadfin shad, largemouth bass, yellowfin goby, and inland silversides. During this quarter we observed three new species: Chinese mitten crab (*Eriocheir sinensis*), northern pike (*Esox lucius*), and duckweed (*Lemna* sp).

Chinese mitten crabs first appeared in the fish salvage in mid-September and were last observed in mid-November. We saw 19 crabs at the SWP and 7 at the CVP. A deltawide summary of mitten crab appearance is being developed.

A northern pike was observed at the SWP fish facility on December 12. The fish was not saved, but the operator was familiar with northern pike. The fish was 207mm fork length and had the following characteristics: light splotches along the sides; long nose and sharp teeth; dorsal fin closer to caudal fin than to head with opposing anal fin; forked tail.

For about 2 weeks around the first of October, large amounts of aquatic weeds, sticks, and debris arrived at the CVP fish facility. The bulk of the problem was caused by Brazilian elodea (*Egeria* sp.) and duckweed (*Lemna* sp.). Brazilian elodea, a continuing problem at the fish facilities, blocked the fish screens, and duckweed filled the interstitial spaces, causing a near-complete blockage at the primary and secondary screen structures. Until this year, duckweed has not been a problem at either fish facility. The high loads this year are thought to be related to removal of the temporary barriers in the southern delta. There was a large buildup of duckweed behind the temporary barriers this year, and this is the first year all three barriers were installed. The SWP fish facility had a similar increase in debris during this period, but fish screen blockage was not serious.

Fish Treadmill Project

Darryl Hayes

Improvements in the hydraulic performance of the fish treadmill have been achieved by several structural modifications of the apparatus. Other recently completed modifications include the water supply well and fish observation and measurement facilities. New fish holding facilities recently completed at the UC-Davis Hydraulics Lab will be used in the investigation in conjunction with expanded fish holding facilities at the University's Fish Ecology Lab. "Shakedown" fish testing has already begun in the treadmill.

CALFED Fish Facilities Development

Darryl Hayes

During December, the Technical Review Team, led by DWR and DFG, met to review and discuss an analysis of the CALFED Phase II fish facility alternatives. The present team, consisting of agency and consulting fish facility experts, will meet about bimonthly through Phase II or until the administrative Draft EIR/EIS is prepared (June 1997). A background report, including conceptual designs, criteria considerations, potential impacts, and hydraulics, was prepared for each of the three remaining alternatives.

Two viable options for major fish facilities remain in the alternatives:

- A significant improvement or reconfiguration of the CVP and SWP southern delta fish facilities.
- A new off-river diversion in the northern delta.

Operational flexibility and improved fish protection in the proposed facilities is the goal.

Contra Costa Canal Intake Entrainment

Jerry Morinaka

Fish entrainment sampling was not conducted during October. We used a sieve-net to sample fish entrainment every fourth day at Contra Costa Canal (on the discharge side of Pumping Plant 1) during November and December. Few fish have been captured in the sieve-net, which is normal during this time of the year at the canal. The predominant fish species captured in November and December were adult redear sunfish (mean fork length 169mm) and adult bluegill (mean fork length 134mm). No chinook salmon, delta smelt, longfin smelt, or splittail were captured in the sieve-net during any of the sampling.

Mallard Slough Monitoring

Jerry Morinaka

We did not monitor within the intake channel of Mallard Slough Pumping Plant or outside the channel in the Sacramento River (Suisun Bay) from October through December. The pumping plant has been inoperable since August and will likely not be used until early 1997. A study plan is being developed to sample actual entrainment at the pumping plant. The study plan will replace the current sampling, which only monitors relative abundance near the diversion of fish species vulnerable to entrainment.

Suisun Ecological Work Group

Eliza Sater

With the encouragement of the Coordinators, the Suisun Ecological Work Group has become a project work team. The ad-hoc committee first convened in May 1995 at the request of SWRCB in its 1995 Water Quality Control Plan. Our aim is to review the scientific basis of Suisun Marsh channel water salinity standards and recommend comprehensive brackish marsh standards. At present, the work group is meeting in technical subcommittees that focus on identifying appropriate water quality standards for various resources. The technical subcommittees are: Brackish Marsh Emergent Wetlands, Waterfowl Habitat, Wildlife, Aquatic Habitat, and Water Quality and Hydrodynamics.